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INT CL6 **G10K 11/36 , H03H 3/08 9/02 9/05 9/10 9/25 9/64 , H05K 9/00**
ONLINE: WPI, EPODOC, JAPIO

(54) Abstract Title
Surface acoustic wave device is mounted face down using an anisotropic conductive resin

(57) The functional surface of a surface acoustic wave device faces a mount surface of a circuit board on which the surface acoustic wave device is to be mounted. The gap between the functional surface and the mount surface is sealed by an anisotropic conductive resin while an oscillation space is maintained between an oscillation transmitting area of the functional surface and the mount surface. The oscillation space is constituted by a space that is formed by the anisotropic conductive resin. Further resins may additionally be used for sealing the device. The functional surface of the SAW device has a protective film. A method of manufacture is also described.

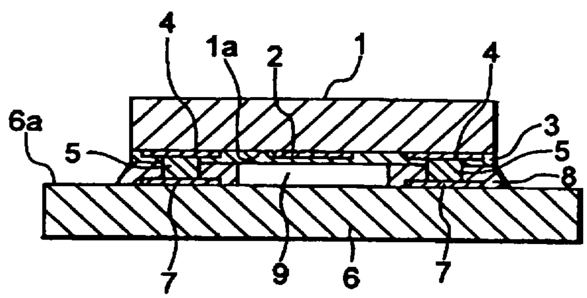

FIG. 3

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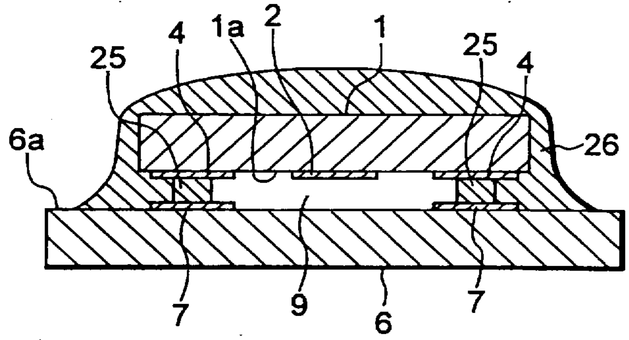
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4
1a
2
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26
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7

FIG. 1

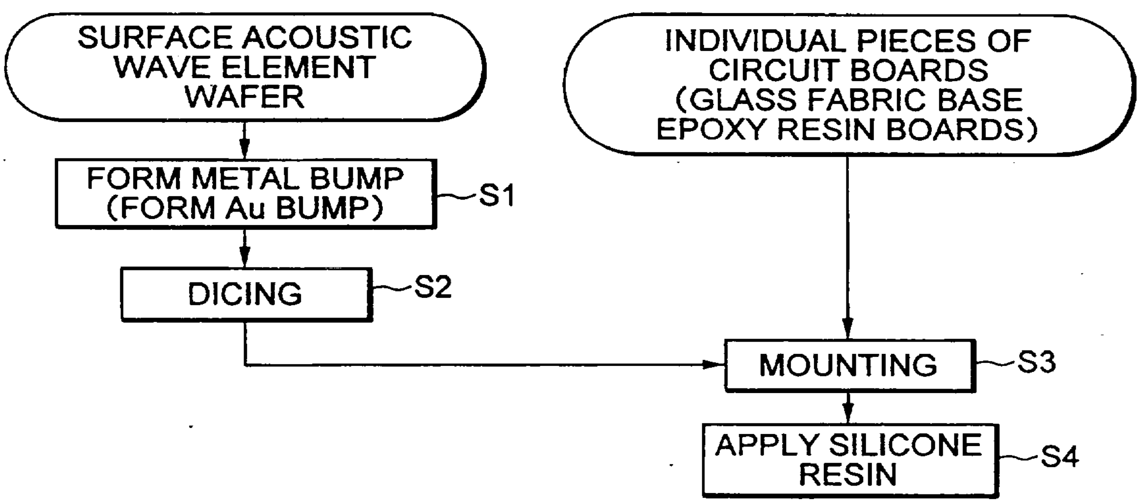
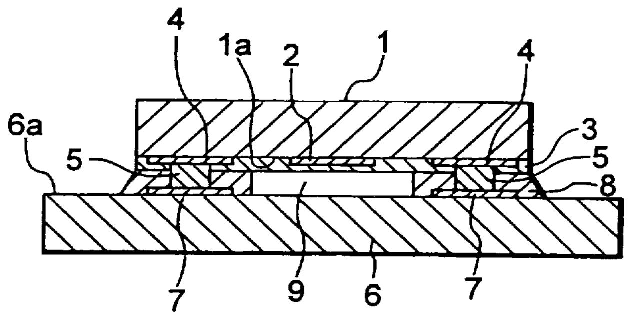

SURFACE ACOUSTIC WAVE ELEMENT WAFER
INDIVIDUAL PIECES OF CIRCUIT BOARDS (GLASS FABRIC BASE EPOXY RESIN BOARDS)
FORM METAL BUMP (FORM Au BUMP)
S1
DICING
S2
MOUNTING
S3
APPLY SILICONE RESIN
S4

FIG. 2


4
1a
2
1
4
6a
3
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8
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6
7

FIG. 3

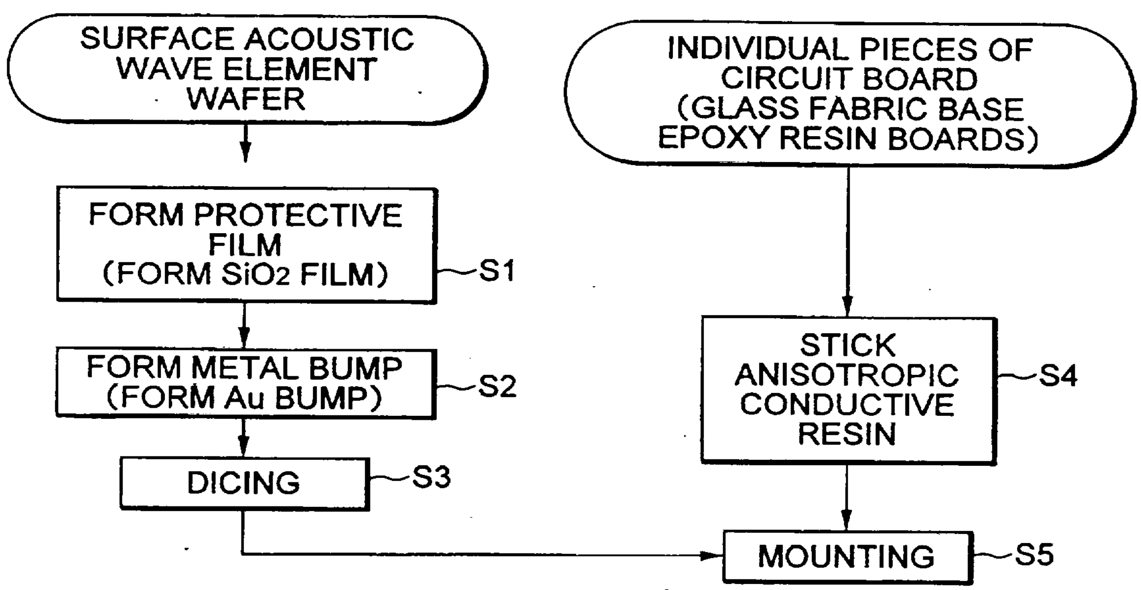
SURFACE ACOUSTIC WAVE ELEMENT WAFER
INDIVIDUAL PIECES OF CIRCUIT BOARD (GLASS FABRIC BASE EPOXY RESIN BOARDS)
FORM PROTECTIVE FILM (FORM SiO2 FILM)
S1
FORM METAL BUMP (FORM Au BUMP)
S2
DICING
S3
STICK ANISOTROPIC CONDUCTIVE RESIN
S4
MOUNTING
S5

FIG. 4

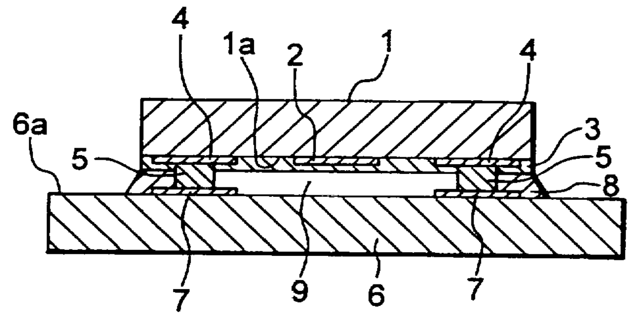

FIG. 5

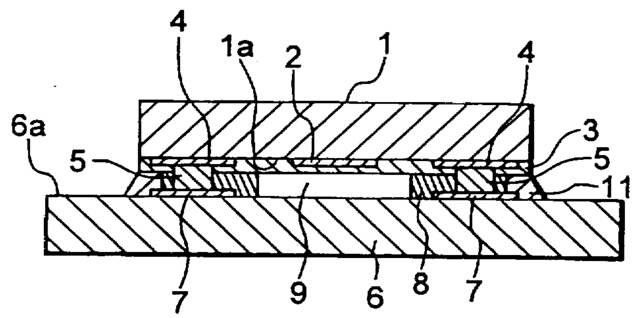

FIG. 6

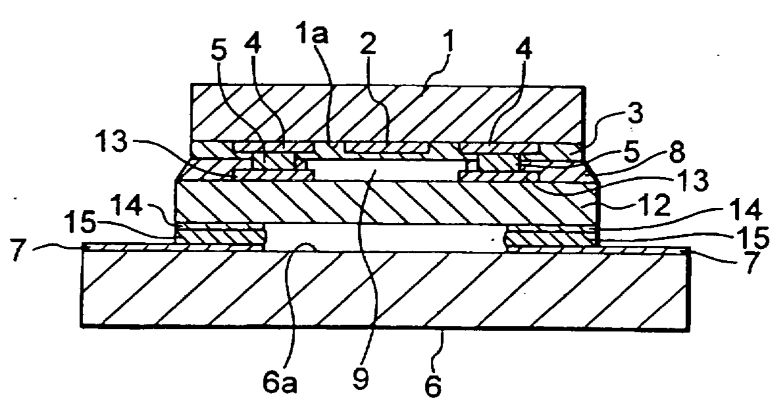

FIG. 7

MOUNTING ARRANGEMENT AND METHOD FOR SURFACE ACOUSTIC WAVE ELEMENT

The present invention relates to a mounting arrangement and a mounting method for a surface acoustic wave element.

As one example of a previously proposed mounting arrangement for and method of mounting a surface acoustic wave element, reference may be made to Japanese Unexamined Patent Publication No. 150405/1992 which discloses a flip-chip mounting arrangement and mounting method.

Reference will now be made to Figs. 1 and 2 of the accompanying drawings which show the previously proposed arrangement, and in which:-

Fig. 1 is a sectional view showing one example of a previously proposed mounting structure for a surface acoustic wave element, and

Fig. 2 is a flowchart for use in describing a method of mounting the surface acoustic wave element shown in Fig. 1.

In the previously proposed mounting arrangement shown in Fig. 1, a comb electrode 2 is formed by Al wiring on a functional surface 1a of a surface acoustic wave element 1, and Au bumps 25 are formed on connecting pads 4 of the surface acoustic wave element 1. The surface acoustic wave element 1 faces a mount surface 6a of a circuit board 6, and is electrically and mechanically connected to the circuit board 6. Silicone resin 26, having high viscosity, is applied to the surface of the acoustic wave element 1 by a dispenser and provides a coating which surrounds the surface acoustic wave element 1.

In the above previously proposed mounting arrangement for the surface acoustic wave element 1, since the silicone resin 26 covers the upper surface and the periphery of the surface acoustic wave element 1, the

mounting structure has an overall size greater than that of the surface acoustic wave element itself.

Also, the silicone resin 26 covers only the upper surface and the periphery of the surface acoustic wave element 1, and an open space remains around the Au bumps 25 connecting the surface acoustic wave element 1 and pads 7 on the circuit board 6. With such an arrangement, if the overall mounting structure is subjected to temperature changes repeatedly, stress is produced due to a difference in the coefficient of thermal expansion between the surface acoustic wave element 1 and the circuit board 6 and directly impinges on joint portions of the Au bumps 25. Accordingly, the Au bumps 25 are susceptible to fatigue failure. The Au bumps 25 are also apt to break due to external impact, e.g. an impact caused in the event that the arrangement is dropped.

Moreover, an epoxy resin or the like can be applied instead of the silicone resin 26 to cover the area around the surface acoustic wave element 1. Depending on the viscosity of the resin applied, however, difficulty is encountered in controlling the configuration of an oscillation space 9 defined between the surface acoustic wave element 1 and the circuit board 6. The reason is that the resin is caused to enter the oscillation space 9 as a result of a capillary phenomenon and is liable to be deposited on an oscillation transmitting area of the functional surface 1a of the surface acoustic wave element 1. If such a deposition of the resin occurs, the desired characteristics of the surface acoustic wave element 1 are no longer obtained.

The previously proposed mounting method will now be described with reference to the flowchart of Fig. 2. First, the Au bumps 25 are formed on the functional surface 1a of the surface acoustic wave element 1 in the form of a wafer, i.e. on the connecting pads 4 which function as input/output terminals and a ground terminal (step S1). Then, the surface acoustic wave

element 1 in the form of a wafer is subjected to dicing for separation into individual chips (step S2).

In a mounting step (step S3) , the surface acoustic wave element 1 is mounted on the circuit board 6 so that the surface acoustic wave element 1 is positioned to face the mount surface 6a of the circuit board 6 with the functional surface 1a directed downwardly. The metal bumps 25 on the surface acoustic wave element 1 are aligned with the pads 7 on the circuit board 6.

Finally, the silicone resin 26 is applied to the rear of the surface acoustic wave element 1 (i.e. the side away from the functional surface 1a) (step S4). The mounting process is thereby completed.

The previously proposed mounting arrangement of the surface acoustic wave element 1 has the following problems.

Firstly, the mounting arrangement has a structure which is a size larger than that of the surface acoustic wave element. Accordingly, the surface acoustic wave element of the previously proposed mounting arrangement is not suitable for use in portable information equipment which requires the electronics to be densely packed.

The above first problem is attributable to the fact that the surroundings of the surface acoustic wave element are covered by the silicone resin. The silicone resin functions to protect the surface acoustic wave element from the external environment and therefore cannot be omitted.

Secondly, in the previously proposed mounting arrangement, the silicone resin covers only the upper surface and the periphery of the surface acoustic wave element, and an open space is left around the Au bumps which connect the surface acoustic wave element and the circuit board. The reliability of the connection is therefore low.

The above second problem is attributable to the fact that, if the entire mounting structure is repeatedly subjected to temperature changes, stress is produced due to a difference in the coefficient of thermal expansion between the surface acoustic wave element and the circuit board and is directly applied to the joint portions of the Au bumps. Accordingly, the Au bumps are susceptible to fatigue failure. The Au bumps are also apt to break due to external impact, e.g. an impact caused in the event that the arrangement is dropped.

Thirdly, a difficulty is encountered in controlling the configuration of the oscillation space defined between the surface acoustic wave element and the circuit board, depending on the viscosity of the resin applied.

The above third problem is attributable to the fact that the resin is caused to enter the oscillation space as a result of a capillary phenomenon and is liable to be deposited on the oscillation transmitting area of the functional surface of the surface acoustic wave element. If such deposition of the resin occurs, the desired characteristics of the surface acoustic wave element are no longer obtained.

Additionally, similar mounting structures and mounting methods for surface acoustic wave elements are disclosed in the specifications of Japanese Unexamined Patent Publications No. 307195/1996, No. 316778/1996, and No. 22763/1998.

Features of arrangements to be described, by way of example in illustration of the present invention, are that it is possible to provide a mounting arrangement for a surface acoustic wave element which is more compact, which is inexpensive and which has a high degree of reliability.

One mounting arrangement, to be described below by way of example in illustration of the present invention, for a surface acoustic wave element includes a functional surface of the surface acoustic wave element

disposed to face a mount surface of a circuit board on which the surface acoustic wave element is to be mounted, and a gap between the functional surface and the mount surface which is sealed off by a resin while an oscillation space is maintained between an oscillation transmitting area of the functional surface and the mount surface, wherein the resin is an anisotropic conductive resin, and the oscillation space is constituted by a space that is formed by the anisotropic conductive resin.

A mounting method for a surface acoustic wave element, to be described below by way of example in illustration of the present invention, includes the steps of arranging a functional surface of the surface acoustic wave element to face a mount surface of a circuit board on which the surface acoustic wave element is to be mounted, sealing off a gap between the functional surface and the mount surface by a resin while maintaining an oscillation space between an oscillation transmitting area of the functional surface and the mount surface, placing an anisotropic conductive resin on the mount surface of the circuit board, the anisotropic conductive resin having a space serving as the oscillation space, positioning the functional surface of the surface acoustic wave element to face the mount surface of the circuit board in aligned relation, and connecting the surface acoustic wave element and the circuit board by heating the surface acoustic wave element to cure the anisotropic conductive resin while the surface acoustic wave element is pressed against the mount surface of the circuit board under pressure.

Arrangements illustrative of the invention will now be described, by way of example, with reference to Figs. 3 to 7 of the accompanying drawings in which:-

Fig. 3 is a sectional view of a first mounting arrangement of a surface acoustic wave element,

Fig. 4 is a flowchart for use in describing the mounting method of the

surface acoustic wave element shown in Fig. 3,

Fig. 5 is a sectional view of a second mounting arrangement of a surface acoustic wave element,

Fig. 6 is a sectional view of a third mounting arrangement of a surface acoustic wave element, and

Fig. 7 is a sectional view of a fourth mounting arrangement of a surface acoustic wave element.

In the mounting arrangements for a surface acoustic wave element to be described, a resin is filled in a gap between the periphery of an oscillation transmitting area of the functional surface of a surface acoustic wave element and the mount surface of a circuit board on which the surface acoustic wave element is to be mounted in a condition in which the functional surface is positioned to face the mount surface while an oscillation space is maintained between the oscillation transmitting area of the functional surface and the mount surface.

Further, an anisotropic conductive resin is used as the resin that is filled in the gap between the periphery of the oscillation transmitting area of the functional surface and the mount surface while the oscillation space is maintained. The oscillation space is securely provided near the oscillation transmitting area of the functional surface by forming a sheet of the anisotropic conductive resin into a desired shape.

Referring now to the drawings there is shown in Fig. 3 a sectional view of a mounting arrangement for a surface acoustic wave element in which a comb electrode 2 is provided on a functional surface 1a of a surface acoustic wave element 1, and a protective film 3 is provided on the functional surface 1a, except on connecting pads 4 on the functional surface 1a of the surface acoustic wave element 1. The connecting pads 4 on the functional surface 1a of the surface acoustic wave element 1 function as input/output

terminals and a ground terminal. Metal bumps 5 are formed on the connecting pads 4.

An anisotropic conductive resin 8 fills a gap between the functional surface 1a of the surface acoustic wave element 1 and the mount surface 6a of the circuit board 6. The anisotropic conductive resin 8 is previously formed into such a shape as to leave a space near to an oscillation transmitting area, including the comb electrode 2, of the functional surface 1a of the surface acoustic wave element 1. The space formed by the anisotropic conductive resin 8 serves as an oscillation space 9 to ensure the characteristics of the surface acoustic wave element 1.

The surface acoustic wave element 1 is disposed with the functional surface 1a facing the mount surface 6a of the circuit board 6, and is electrically connected to board pads 7 on the mount surface 6a of the circuit board 6 through the metal bumps 5 and conductive (metal) particles (not shown) contained in the anisotropic conductive resin 8.

The anisotropic conductive resin 8 is in the form of a continuous frame surrounding the oscillation space 9, and is interposed between the surface acoustic wave element 1 and the circuit board 6. Also, the anisotropic conductive resin 8 covers the peripheries of the metal bumps 5.

Referring to Fig. 4, it will be seen that the protective film 3 is first provided on the functional surface 1a of the surface acoustic wave element 1 in the form of a wafer, except on the connecting pads 4 (step S1). Then, the metal bumps 5 are provided by plating, wire bonding, bump transfer or the like on the connecting pads 4, which are on the functional surface 1a of the surface acoustic wave element 1 and function as input/output terminals and a ground terminal (step S2).

Subsequently, the surface acoustic wave element 1 in the form of a wafer is subjected to dicing for separation into individual chips (step S3)

Next, a sheet of the anisotropic conductive resin 8 is caused to adhere to the mount surface 6a of the circuit board 6 at a mount position of the surface acoustic wave element 1 (step S4) . The sheet of the anisotropic conductive resin 8 is machined to have substantially the same size as the surface acoustic wave element 1, and is cut out in the portion corresponding to the oscillation transmitting area, including the comb electrode 2, of the functional surface 1a of the surface acoustic wave element 1. Thus the resin sheet is previously formed into a shape hollowed in the above-mentioned portion.

In a mounting step (step S5) , the surface acoustic wave element 1 is mounted on the circuit board 6 such that the surface acoustic wave element 1 is positioned to face the mount surface 6a of the circuit board 6 with the functional surface 1a directed downwardly, and the metal bumps 5 on the surface acoustic wave element 1 aligned with the board pads 7 on the circuit board 6. Further, the assembly is subjected to pressure and heating while the metal bumps 5 and the board pads 7 are held in contact with each other. The anisotropic conductive resin 8 is thereby cured to bond the surface acoustic wave element 1 and the circuit board 6 together. With the above steps, the mounting arrangement of the surface acoustic wave element shown in Fig. 3 can be obtained.

Referring to Fig. 5, a second arrangement, which is the same as the above-described first arrangement in that the anisotropic conductive resin 8 is in the form of a continuous frame surrounding the oscillation space 9, differs from the above-described first arrangement in that the anisotropic conductive resin 8 does not cover the peripheries of the metal bumps 5. Thus, in this arrangement, the metal bumps 5 directly contact the board pads 7 on the circuit board 6.

This arrangement is suitable for application to, for example, the case

in which there is a small difference in the coefficient of thermal expansion between the surface acoustic wave element 1 and the circuit board 6, causing a small stress to be produced in joint portions of the metal bumps 5.

Referring to Fig. 6, in this third arrangement, a second resin 11 further covers the surroundings of the anisotropic conductive resin 8 which fills the gap between the surface acoustic wave element 1 and the circuit board 6. Any of the known insulating resins and conductive resins can be employed as the second resin 11.

This third arrangement can be implemented in several forms. In one form, a layer of the second resin 11 is formed only in the gap between the surface acoustic wave element 1 and the circuit board 6. In another form, the resin layer is formed to cover the side of the surface acoustic wave element 1 as well. In still another form, the resin layer is formed to cover a part or the whole of the rear of the surface acoustic wave element 1 as well. In any form, the second resin 11 serves to improve resistance against moisture tending to intrude into the oscillation space 9 and the surface of the comb electrode 2.

As may be seen from Fig. 6, the illustrated arrangement represents the form in which the layer of the second resin 11 is provided only in the gap between the surface acoustic wave element 1 and the circuit board 6.

In the form in which the second resin 11 covers a part, or the whole of, the rear of the surface acoustic wave element 1 as well, the following advantage is obtained. If the second resin 11 is a conductive resin and a conductive layer is formed on the rear of the surface acoustic wave element 1, electrical connection is established between the rear of the surface acoustic wave element 1 and any desired circuit portion of the circuit board 6. As a result, the rear of the surface acoustic wave element 1 can be held at any desired potential.

Referring to Fig. 7, in this fourth arrangement, the surface acoustic

wave element 1 is mounted on a carrier board 12 having a size substantially equal to that of the surface acoustic wave element 1. The connecting pads 4 on the surface acoustic wave element 1 are electrically connected to carrier board pads 13 on the carrier board 12 through the metal bumps 5 and conductive particles (not shown) contained in the anisotropic conductive resin 8. A gap between the surface acoustic wave element 1 and the carrier board 12 is filled by the anisotropic conductive resin 8 to ensure the oscillation space 9.

The surface acoustic wave element 1 and the carrier board 12 have substantially the same outer shapes, and constitute an ultra-compact package.

The carrier board 12 is connected to the board pads 7 on the circuit board 6 through solder bumps 15 with the aid of carrier board outer pads 14. While the carrier board 12 is connected to the circuit board 6 through only the solder bumps 15, in the illustrated arrangement, resin may be filled in a gap between the carrier board 12 and the circuit board 6. Filling the gap with resin improves the reliability of the connection established by the solder bumps 15.

In Fig. 7 showing the fourth arrangement, one kind of resin, i.e., an anisotropic conductive resin 8, fills the gap between the surface acoustic wave element 1 and the carrier board 12. However, an ultra-compact package can also be obtained by filling the above gap with two or more kinds of resin in a manner similar to that described with reference to Fig. 6.

In Figs. 6 and 7 showing respectively the third and fourth illustrative arrangements, the peripheries of the metal bumps 5 are covered by the anisotropic conductive resin 8 and the second resin 11. However, it is apparent that the third and fourth arrangements may be modified so that the peripheries of the metal bumps 5 are not covered by any resin, as in the second arrangement.

A concrete example of a mounting arrangement for the surface acoustic wave element of the type shown in Fig. 3, will be described below in more detail with reference to the drawing.

The comb electrode 2 is formed by Al wiring on the functional surface 1a of the surface acoustic wave element 1, and a SiO_2 film is formed as the protective film 3 on the functional surface 1a with a thickness ranging from 0.01 to 0.2 μm. Au bumps are formed as the metal bumps 5 by wire bonding on the connecting pads 4, which function as input/output terminals and a ground terminal on the functional surface 1a of the surface acoustic wave element 1. The SiO_2 film (protective film) 3 may be formed over only the comb electrode 2 or over the entire functional surface 1a, except for the areas where the Au bumps (metal bumps) are to be formed.

The anisotropic conductive resin 8 fills the gap between the functional surface 1a of the surface acoustic wave element 1 and the mount surface 6a of a glass-fibre reinforced epoxy resin board as the circuit board 6. The anisotropic conductive resin 8 is previously formed into such a shape as to leave a space near to the oscillation transmitting area, including the comb electrode 2, of the functional surface 1a of the surface acoustic wave element 1. That space serves as the oscillation space 9 to ensure the characteristics of the surface acoustic wave element 1.

The surface acoustic wave element 1 is disposed with the functional surface 1a facing the mount surface 6a of the glass-fibre reinforced epoxy resin board 6, and is electrically connected to the board pads 7 on the mount surface 6a of the glass-fibre reinforced epoxy resin board 6 through the Au bumps 5 and Au particles (not shown) contained in the anisotropic conductive resin 8.

The anisotropic conductive resin 8 which is in the form of a continuous frame surrounding the oscillation space 9 holds the surface

acoustic wave element 1 and the circuit board 6. Also, the anisotropic conductive resin 8 covers the peripheries of the Au bumps 5.

Examples of the anisotropic conductive resin 8 used in the present arrangements may contain Ni particles, metal-plated plastics particles, etc., dispersed in a resin matrix, other than the Au particles as described above.

The comb electrode 2 and the connecting pads 4 are preferably made of Al, which is inexpensive, and which can easily provide the desired characteristics of the surface acoustic wave element 1, but may be formed of any other suitable conductive material.

A thickness of the SiO_2 film 3 in excess of 0.02 p.m is usually sufficient. A film of Si, SiN or the like can also be employed instead of the SiO_2 film.

The circuit board 6 may be a ceramic board, a glass board, a flexible board or the like instead of the glass-fibre reinforced epoxy resin board mentioned.

The mounting method of the surface acoustic wave element shown in Fig. 4, will now be described in more detail with reference to Fig. 4.

First, a SiO_2 film is provided as the protective film 3 on the functional surface 1a of the surface acoustic wave element 1 in the form of a wafer, except for on the connecting pads 4 (step S1) . Then, Au bumps are provided as the metal bumps 5 on the connecting pads 4 by wire bonding (step S2)

Next, the surface acoustic wave element 1 in the form of a wafer is subjected to dicing for separation into individual chips (step S3).

Subsequently, a sheet of the anisotropic conductive resin 8 is caused to adhere to the mount surface 6a of the circuit board 6 (step S4). The sheet of the anisotropic conductive resin 8 is machined to have substantially the same size as the surface acoustic wave element 1, and is previously cut out to have a hollowed shape in the portion where the oscillation space 9 is to be

formed.

In a mounting step (step S5) , the surface acoustic wave element 1 is mounted on the glass-fibre reinforced epoxy resin board 6 so that the surface acoustic wave element 1 is positioned to face the mount surface 6a of the glass-fibre reinforced epoxy resin board 6 with the functional surface 1a directed downwardly, and the Au bumps 5 on the surface acoustic wave element 1 aligned with the board pads 7 on the glass-fibre reinforced epoxy resin board 6. At this time, the surface acoustic wave element 1 is mounted under pressure in the range of 30 to 150 g per an Au bump 5, and is heated to 150°C or more while the Au bumps 5 and the board pads 7 are held under pressure in contact with each other. The anisotropic conductive resin 8 is thereby cured to bond the surface acoustic wave element 1 and the circuit board 6 together.

Additionally, the Au bumps 5 may be leveled to be even in height, if necessary, prior to the mounting step. Also, the anisotropic conductive resin 8 preferably has almost the same height as that of the Au bumps 5, after the mounting step.

A first advantage of the mounting arrangements for surface acoustic wave elements described above is that the size occupied by the mounting arrangement can be reduced to almost the same size as the surface acoustic wave element itself.

The reason for this is that the oscillation space is formed by the anisotropic conductive resin, and the anisotropic conductive resin fills only the gap between the functional surface of the surface acoustic wave element and the mount surface of the circuit board in a condition in which the oscillation space is maintained. As a result, a more compact mounting arrangement can be achieved without affecting the characteristics of the surface acoustic wave element.

A second advantage of the mounting structures for surface acoustic wave elements described above is that even when an inexpensive board, e.g. a glass-fibre reinforced epoxy resin board, is employed as the circuit board, a required level of reliability can be provided.

The reason is that since the oscillation space is formed by the anisotropic conductive resin interposed between the functional surface of the surface acoustic wave element and the mount surface of the circuit board, external adverse effects, for example that caused by dust, can be avoided and problems, such as electrode corrosion due to the intrusion of moisture, can also be avoided.

Another reason, particularly in the case in which the anisotropic conductive resin is disposed so as to cover the peripheries of the metal bumps connecting the surface acoustic wave element and the circuit board, is that the joint portions of the metal bumps are kept from being directly subjected to stress produced as a result of a difference in the coefficient of thermal expansion between the surface acoustic wave element and the circuit board. Thus fatigue failure of the metal bumps can be minimised.

It will be understood that, although particular arrangements have been described by way of example in illustration of the invention, variations and modifications thereof, as well as other arrangements, may be conceived within the scope of the appended claims.

CLAIMS

1. A mounting arrangement for a surface acoustic wave element in which a functional surface of the surface acoustic wave element is positioned to face a mount surface of a circuit board on which the surface acoustic wave element is to be mounted, and in which a gap between the functional surface and the mount surface is sealed by a resin, while an oscillation space is maintained between an oscillation transmitting area of the functional surface and the mount surface, wherein the resin is an anisotropic conductive resin, and the oscillation space is a space that is formed by the anisotropic conductive resin.

2. A mounting arrangement for a surface acoustic wave element as claimed in claim 1, wherein a filling portion of the anisotropic conductive resin interposed between the functional surface and the mount surface is in the form of a continuous frame surrounding the oscillation space.

3. A mounting arrangement for a surface acoustic wave element as claimed in claim 1, wherein the surface acoustic wave element is electrically interconnected to the circuit board by metal bumps, and the metal bumps are surrounded by the anisotropic conductive resin.

4. A mounting arrangement for a surface acoustic wave element as claimed in claim 1, wherein a protective film is formed on the functional surface to cover at least the oscillation transmitting area.

5. A mounting arrangement for a surface acoustic wave element as claimed in claim 4, wherein the protective film is at least one of Si, SiO_2, and SiN.

6. A mounting arrangement for a surface acoustic wave element as claimed in claim 1, wherein a second resin surrounds the anisotropic conductive resin along an outer peripheral edge of the oscillation space.

7. A mounting arrangement for a surface acoustic wave element as claimed in claim 1, wherein the circuit board is a glass-fibre reinforced epoxy resin board, or a ceramic board.

8. A method of mounting a surface acoustic wave element in which a functional surface of the surface acoustic wave element faces a mount surface of a circuit board on which the surface acoustic wave element is to be mounted, and a gap between the functional surface and the mount surface is sealed by a resin, while an oscillation space is maintained between an oscillation transmitting area of the functional surface and the mount surface, the method including the steps of:-

placing an anisotropic conductive resin on the mount surface of the circuit board, the anisotropic conductive resin having a space serving as the oscillation space,

positioning the functional surface of the surface acoustic wave element to face the mount surface of the circuit board in an aligned relation, and

connecting the surface acoustic wave element and the circuit board by heating the surface acoustic wave element to cure the anisotropic conductive resin while the surface acoustic wave element is held against the mount surface of the circuit board under pressure.

9. A mounting arrangement as claimed in claim 1 substantially as described herein with reference to any one of Figs. 3, 5, 6 or 7 of the

accompanying drawings.

10. A method of mounting as claimed in claim 8 substantially as described herein with reference to Fig. 4 of the accompanying drawings.

The Patent Office

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Application No:	GB 9918278.4	**Examiner:**	Rowland Hunt
Claims searched:	All	**Date of search:**	5 November 1999

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): H3U (UAB, UES, UEX); H1E (EE, EX)

Int Cl (Ed.6): HO3H 3/08, 9/02, 9/25, 9/05, 9/10, 9/64; HO5K 9/00; G10K 11/36

Other: Online: WPI, EPODOC, JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X,P	GB 2334618 A	(NEC) whole doc., particularly fig. 3, page 9 lines 21 to page 10 line 1 and page 5 lines 18-20	1,2,4,5
A	GB 2297424 A	(MURATA)	
X,Y	EP 0794616 A2	(MATSISHUTA) whole doc., particularly fig 1b and col 11, lines 35-41	1,2,3,4,7
Y	JP 09162693 A	(KOKUSAI) whole doc. particularly figs. 2b and 3	1

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.